WHAT IS CLAIMED IS:

1. A frequency converter for converting a frequency of an input signal to an arbitrary frequency, comprising:

a polyphase structure filter for multiplying M polyphase filters each having N=L/M coefficients (where L and M are both positive integers) determined by dividing L coefficients by M, by M signals determined by sampling signals for a period K of a sine wave having a period M/K for one sampling period, on a one-to-one basis; and

a sampling frequency converter with a conversion ratio M.

2. The frequency converter as set forth in claim 1, further comprising:

a polyphase structure filter or a sampling frequency converter with a conversion ratio M1, for multiplying M1 polyphase filters by M1 signals determined by sampling signals for a period K of a sine wave having a period M1/K for one sampling period, on a one-to-one basis; and

a polyphase structure filter or a sampling frequency converter with a conversion ratio M2, for multiplying M2=M-M1 polyphase filters by M2 signals determined by sampling signals for a period K of a sine wave having a period M2/K for one sampling period, on a one-to-one basis.

3. The frequency converter as set forth in claim 1, further comprising:

an I-fold interpolator (where I is a positive integer) arranged in a stage following the polyphase structure filter;

wherein the polyphase structure filter multiplies (M×I) polyphase filters each having P=L/(M×I) coefficients determined by dividing L coefficients by (M×I), by (M×I) signals determined by sampling signals for a period K of a sine

wave having a period (M×I)/K for one sampling period, on a one-to-one basis; and

wherein the sampling frequency converter performs 1/(M×I)-fold interpolation.

4. The frequency converter as set forth in claim 1, further comprising:

a 1/D-fold decimator (where D is a positive integer) arranged in a stage preceding the polyphase structure filter;

wherein the polyphase structure filter multiplies (M×D) polyphase filters each having Q=L/(M×D) coefficients determined by dividing L coefficients by (M×D), by (M×D) signals determined by sampling signals for a period K of a sine wave having a period (M×D)/K for one sampling period, on a one-to-one basis; and

wherein the sampling frequency converter performs (M×D)-fold interpolation.

5. A frequency converter for converting a frequency of an input signal to an arbitrary frequency, comprising:

a polyphase structure filter for multiplying M polyphase filters each having as one coefficient a code calculated by dividing M codes (where M is a positive integer) by M, by M signals determined by sampling signals for a period K of a sine wave having a period M/K for one sampling period, on a one-to-one basis; and

a sampling frequency converter with a conversion ratio M;

wherein the input signal is correlated with the code.

6. A frequency converter for converting a frequency of an input signal to an arbitrary frequency, the frequency converter including a polyphase

structure filter having M polyphase filters with N=L/M coefficients determined by dividing L coefficients by M (where L and M are both positive integers), the frequency converter, comprising:

the polyphase filter including;

a coefficient bank for switching one bank each time M input discrete time sequences are received, and assigning P kinds (where P is a positive integer larger than 2) of filter coefficient sequences to multipliers of the polyphase filters one by one;

wherein the coefficient bank of an M^{th} polyphase filter provides P kinds of coefficient sequences for the M^{th} polyphase filter among P kinds of a total of M phase coefficients calculated by multiplying coefficients determined by repeating M original phase coefficient sequences of the polyphase filter P times in a phase direction by P×M signals determined by sampling signals for a period K of a sine wave having a period P×M/K for one sampling period, on a one-to-one basis.